

What is claimed is:

1. An apparatus for controlling the power management of a display monitor, said apparatus comprising:
  - a power supply unit for converting an AC input voltage to a DC output voltage;
  - a voltage regulator for producing a constant output voltage supplied to the monitor,
  - a transformer for producing necessary operating voltages for each part of the monitor, in which the output voltage of the voltage regulator being supplied to a primary of the transformer;
  - a feedback circuit for detecting current variation at the output of the transformer and for supplying the detected variation value to the voltage regulator;
  - a switching circuit provided in a heater power supply line between one output of the transformer and a heater of a color display tube of the monitor for switching off the heater power supply line when the monitor enters a power-off mode,
  - a microcomputer operated in response to a video signal received at a video input port of the monitor to produce a power control signal and a corresponding control mode indicating signal;
  - a signal input port connected to a video output of a computer; and
  - a signal amplifier for amplifying and processing a video input signal supplied to a signal input of the color display tube.
2. The apparatus according to claim 1, the switching circuit including:
  - a first transistor for switching on or off the heater power supply line between one output of the transformer and the heater of the color display tube in response to a base bias current supplied from said output of the transformer;
  - a second transistor for selectively switching a base bias current path of the first transistor to ground, and
  - a third transistor for selectively switching a operating voltage supply line to a base bias resistor of the second transistor or to ground in response to the level of the power control signal supplied from the microcomputer
3. The apparatus according to claim 1, the microcomputer generating a continuous high level signal as the power control signal when the monitor enters the power-off mode
4. The apparatus according to claim 1, the microcomputer generating the mode indicating signal consisting of a continuous pulse train signal having a predetermined on/off pulse duration, when the monitor enters the power-off mode.
5. The apparatus according to claim 1, further comprising a mode indicator for indicating the power control mode of the monitor in response to the power control signal and the mode indicating signal, the mode indicator comprising
  - a first voltage supply for operating a first light emitting diode (LED);
  - a second voltage supply for operating a second LED;

- a first switching transistor operated in response to the mode indicating signal generated by the microcomputer for switching on or off a first voltage supply line including the first LED to ground; and
  - a second switching transistor operated in response to the power control signal generated by the microcomputer for switching a second voltage supply line to ground; said second voltage supply being connected to said first voltage supply through a series combination of a diode and the second LED.
6. The apparatus according to claim 5, the first voltage being lower than the second voltage.
7. An apparatus for controlling the power management of a display monitor having a color display tube, said apparatus comprising:
- a power supply means for supplying power to the monitor including supplying a heater voltage to a heater of the color display tube;
  - a switching circuit disposed between said power supply means and said heater of the color display tube for selectively switching off the voltage to said heater when the monitor enters a power-off mode; [and]
  - a control means connected to said switching circuit and receiving a video signal at a video input port of the monitor and for producing a power control signal in response thereto for controlling said switching circuit, said control means producing a mode indicating signal in response to the video signal; and
8. The apparatus according to claim 7, [further comprising a mode indicator for indicating the power control mode of the monitor; and
- a mode indicator connected to said control means, receiving the power control and mode indicating signals from said control means, indicating a power mode of the monitor in response to the power control and mode indicating signals.
- said control means further producing a control mode indicating signal in response to said video signal, said mode indicator being connected to said control means and indicating the power control mode of the monitor in response to said power control signal and mode indicating signal generated by said control means] the video signal including color picture signals R, G, and B.
9. A method of controlling the power utilized by a display monitor having a color display tube, said method comprising:
- providing necessary operating voltages to the monitor including supplying a heater voltage for [supplying] a heater of the color display tube of the monitor, the heater voltage being provided from a power supply to the heater through a switching unit;
  - receiving a video signal at a video input port of the monitor and generating a power control signal in response [thereto] to the video signal, the video signal including color picture signals R, G, and B; [and]
  - selectively switching off the heater voltage to the heater of the color display tube in response to the power control signal, said switching being performed by the switching unit disposed between the power supply and the heater; generating a mode indicating signal in response to the video signal; and
  - indicating a power mode of the monitor in dependence upon the power control and mode indicating signals.
10. The method according to claim 9, [further comprising the step of providing a mode indicator for indicating the power control mode of the monitor;
- generating a control mode indicating signal in response to the video signal received at the video input port of the monitor; and
  - the mode indicator indicating the power control mode of the monitor in response to the generated power control signal and mode indicating signal] said generating of the power control and mode indicating signals being performed by a microcomputer, said indicating of the power mode being performed by an indicating unit receiving the power control and mode indicating signals from the microcomputer.

1       11. An apparatus, comprising:

2       a power supply providing power to a heater of a tube in a monitor; and

3       a switch being disposed between said power supply and the heater, said switch switching  
4       off the power provided to the heater when the monitor enters a power-off mode.

1       12. The apparatus of claim 11, further comprising:

2       a control unit receiving a video synchronization signal, and generating a control signal in  
3       dependence upon the received video synchronization signal to control said switch.

4       13. The apparatus of claim 11, further comprising:

5       an indicator indicating a present power mode of the monitor.

6       14. The apparatus of claim 13, said present power mode of the monitor being one selected  
7       from among a plurality of power modes, in accordance with display power management signaling  
8       standard.

9       15. The apparatus of claim 14, said indicator comprising at least one light emitting diode.

10       16. The apparatus of claim 11, said switch comprising at least one transistor.

1 17. A method, comprising:

2 providing power to a heater of a tube in a monitor;

3 providing a switch between a source of said power and said heater; and

4 turning off said switch when the monitor enters a power-off mode.

1 18. The method of claim 17, further comprising:

2 receiving a video synchronization signal; and

3 generating a control signal in dependence upon the received video synchronization signal  
4 to control said switch.

1 19. The method of claim 17, further comprising:

2 indicating a power mode of the monitor.

3 20. The method of claim 19, said indicating of the power mode of the monitor being  
4 performed in dependence upon a mode signal, the mode signal being generated in dependence  
5 upon the video synchronization signal.

1 21. A computer storage medium having stored thereon a set of instructions implementing

2 a method, the set of instructions comprising one or more instructions:

3 providing power to a heater of a tube in a monitor;

4 providing a switch between a source of said power and said heater; and

5 turning off said switch when the monitor enters a power-off mode.

1 22. The computer storage medium according to claim 21, said set of instructions further  
2 comprising one or more instructions for:

3 receiving a video synchronization signal; and

4 generating a control signal in dependence upon the received video synchronization signal  
5 to control said switch.

6 23. The computer storage medium according to claim 21, said set of instructions further  
7 comprising one or more instructions for:

8 indicating a power mode of the monitor.

9 24. The computer storage medium according to claim 23, said one or more instructions  
10 for indicating the power mode of the monitor comprising one or more instructions for:

11 indicating the power mode of the monitor based on a mode signal, the mode signal being  
12 generated in dependence upon the video synchronization signal.

13 25. An apparatus, comprising:

14 a control unit receiving signals, and generating a control signal in dependence upon the  
15 received signals; and

16 a switch being disposed between a power supply and a heater in a monitor, said switch

5 selectively switching on and off in response to the control signal, said switch switching on to  
6 convey power from the power supply to the heater when the control signal does not correspond to  
7 a power off mode of the monitor, said switch switching off to prevent the heater from receiving  
8 power from the power supply when the control signal corresponds to the power off mode of the  
9 monitor.

1 26. The apparatus of claim 25, said received signals not including synchronization signals  
2 when the monitor enters the power off mode.

3 27. The apparatus of claim 25, further comprising:  
4 an indicator indicating a present power mode of the monitor.

5 28. The apparatus of claim 27, said present power mode of the monitor being one selected  
6 from among a plurality of power modes, in accordance with display power management signaling  
7 standard.

1 29. The apparatus of claim 27, said indicator comprising at least one light emitting diode.

1 30. The apparatus of claim 25, said switch comprising at least one transistor.

1 31. A method, comprising:

2       receiving at least one signal, and generating a control signal in dependence upon the  
3 received at least one signal;

4       when the control signal does not correspond to a power off mode of a monitor, conveying  
5 power from a power supply to a heater in the monitor; and

6       when the control signal does correspond to the power off mode of the monitor, preventing  
7 the heater from receiving power.

1       32. The method of claim 31, the received signal not including synchronization signals  
2 when the monitor enters the power off mode.

3       33. The method of claim 32, further comprising:

4       indicating a power mode of the monitor.

5       34. The method of claim 33, said step of indicating of the power mode of the monitor  
6 comprising:

7       indicating of the power mode of the monitor based on a mode signal, the mode signal  
8 being generated in dependence upon the synchronization signals.

9       35. A computer storage medium having stored thereon a set of instructions implementing  
10 a method, the set of instructions comprising one or more instructions:

11       receiving at least one signal, and generating a control signal in dependence upon the

4 received at least one signal;

5 when the control signal does not correspond to a power off mode of a monitor, conveying  
6 power from a power supply to a heater in the monitor; and

7 when the control signal does correspond to the power off mode of the monitor, preventing  
8 the heater from receiving power.

1 36. The computer storage medium according to claim 35, said set of instructions further  
2 comprising one or more instructions for:

3 indicating a power mode of the monitor.

4 37. The computer storage medium according to claim 36, said set of instructions further  
5 comprising one or more instructions for:

6 indicating the power mode of the monitor based on a mode signal, the mode signal being  
7 generated in dependence upon video synchronization signals.

1 38. An apparatus, comprising:

2 a control unit having an input terminal receiving an input signal, and having an output  
3 terminal outputting a control signal in dependence upon the received input signal, the control  
4 signal corresponding to a first power signal when the input signal does not include  
5 synchronization signals;

6 a power supply supplying power;

7 a heater of a cathode ray tube of a monitor; and

8 a switch being disposed between said power supply and said heater, said switch having a  
9 first input terminal connected to said power supply and receiving the power, a second input  
10 terminal connected to said control unit and receiving said control signal, and an output terminal  
11 connected to said heater, said switch selectively operating in response to the control signal  
12 received from said control unit, said switch conveying the power from said power supply to said  
13 heater when the control signal does not correspond to the first power signal, said switch not  
14 conveying the power from said power supply to said heater when the control signal corresponds  
15 to the first power signal.

16 39. The apparatus of claim 38, further comprising:

17 an indicator indicating a selected power mode of the monitor.

18 40. The apparatus of claim 39, said selected power mode of the monitor being one  
19 selected from among a plurality of power modes according to display power management  
20 signaling standard.

21 41. The apparatus of claim 40, said indicator comprising at least one light emitting diode.

22 42. The apparatus of claim 38, said switch comprising at least one transistor.

1       43. A method, comprising:

2       detecting whether a synchronization signal is present;

3       generating a control signal in dependence upon the detected presence of the  
4       synchronization signal, the control signal corresponding to a first power signal when the  
5       synchronization signal is not present; and

6       preventing power from a power supply from being conveyed to a heater of a cathode ray  
7       tube when the first power signal is generated.

8       44. The method of claim 43, further comprising:

9       indicating a selected power mode, said selected power mode being selected from a  
10       plurality of power modes according to display power management system standard.

11       45. The method of claim 44, said step of indicating of the power mode comprising:

12       indicating the power mode based on a mode signal, the mode signal being generated in  
13       dependence upon the control signal.

14       46. A computer storage medium having stored thereon a set of instructions implementing  
15       a method, the set of instructions comprising one or more instructions:

16       detecting whether a synchronization signal is present;

17       generating a control signal in dependence upon the detected presence of the  
18       synchronization signal, the control signal corresponding to a first power signal when the

synchronization signal is not present;

conveying power from a power supply to a heater of a cathode ray tube when the first  
power signal is not generated; and

preventing the power from a power supply from being conveyed to the heater when the  
first power signal is generated.

47. The computer storage medium claim 46, said set of instructions further comprising  
one or more instructions for:

indicating a selected power mode, said selected power mode being selected from a  
plurality of power modes according to display power management system standard.

48. The computer storage medium claim 47, said set of instructions further comprising  
one or more instructions for:

indicating the power mode based on a mode signal, the mode signal being generated in  
dependence upon the control signal.

49. An apparatus for controlling the power management of a display monitor having a  
color display tube, the apparatus comprising:

a power supply unit supplying a heater voltage to a heater of the color display tube;

a switching circuit disposed between said power supply unit and said heater selectively  
switching off the voltage to said heater when the monitor enters power-off mode;

6        a control unit connected to said switching circuit, receiving an input signal at a video  
7        input port of the monitor, producing a power control signal in response to the input signal, said  
8        switching circuit switching in response to the power control signal, said control unit producing a  
9        mode indicating signal in response to the input signal; and

10       a mode indicator connected to said control unit, receiving the mode indicating signal from  
11       said control unit, and indicating a power mode of the monitor in response to the mode indicating  
12       signal.

50. The apparatus according to claim 49, said mode indicator comprising one or more  
light emitting diodes.

51. A method of controlling the power utilized by a display monitor having a color  
display tube, the method comprising:

providing necessary operating voltage to the monitor including supplying a heater voltage  
      for a heater of the color display tube of the monitor, the heater voltage being provided from a  
5       power supply to the heater through a switching unit;

6       receiving an input signal at a video input port of the monitor and generating a power  
7       control signal in response to the input signal;

8       selectively switching off the heater voltage to the heater of the color display tube in  
9       response to the power control signal, said switching being performed by the switching unit  
10       disposed between the power supply and the heater;

11 generating a mode indicating signal in response to the input signal; and  
12 indicating a power mode of the monitor in dependence upon the mode indicating signal.

1 52. The method according to claim 51, further comprising:

2 detecting whether said input signal includes a synchronization signal; and

3 generating said power control signal when said input signal does not include the  
4 synchronization signal.

5 53. An apparatus, comprising:

6 a control unit receiving an input signal, generating a power control signal in dependence  
7 upon said input signal, said control unit being configured to generate a mode indication signal in  
8 dependence upon said input signal;

9 a switching unit receiving a power and receiving said power control signal, said switching  
10 unit switching on and off in dependence upon said power control signal, said switching unit  
11 switching on to supply the received power to a heater in a monitor, said switching unit switching  
12 off to directly cut off the supply of power to the heater when said power control signal  
13 corresponds to a power-off mode; and

14 a mode indicator receiving said mode indication signal from said control unit, said mode  
15 indicator indicating a power mode of the monitor in dependence upon said received mode  
16 indication signal.

1        54. The apparatus of claim 53, said control unit being configured to generate said power  
2        control signal when said input signal does not include a synchronization signal.

1        55. A display apparatus having a tube heater, comprising:  
2        a power supply outputting a power;  
3        a control unit detecting a synchronization signal, and generating a first control signal  
4        when said synchronization signal is not detected;  
5        a switch being disposed between said power supply and said tube heater, said switch  
6        being configured to receive the first control signal from said control unit, said switch switching  
7        off to prevent the power from being delivered to the heater when the first control signal is  
8        received.

1        56. The display apparatus of claim 55, said control unit being configured to generate a  
2        second control signal when said synchronization signal is detected, said switch switching on in  
3        response to the second control signal and conveying the power from said power supply through  
4        said switch to said tube heater.

1        57. The display apparatus of claim 55, further comprising:  
2        an indicator indicating a currently selected power mode of the display apparatus, said  
3        currently selected power mode being selected from a plurality of power modes according to  
4        display power management signaling standard.

1        58. The display apparatus of claim 57, said indicator indicating the power mode of the  
2        display apparatus in dependence upon a mode signal received from said control unit, said control  
3        unit generating the mode signal in dependence upon a detection of said synchronization signal.

1        59. The apparatus of claim 58, said indicator comprising at least one light emitting diode.

1        60. The apparatus of claim 55, said switch comprising at least one transistor.